Memorial University of Newfoundland

Engineering 9865 Advanced Digital Systems

COURSE OUTLINE

Winter 2011

http://www.engr.mun.ca/~licheng/9865

Instructor: Cheng Li, licheng@engr.mun.ca, EN - 4012, 864- 8972

Office Hours: Monday 14:00 - 16:00, or by individual appointment

Lectures: Tuesday 10:30 – 11:45, Wednesday 11:00 – 12:15 in EN - 4008

Labs: Thursday 14:00 - 17:00 in EN - 4033

Objective: This course aims to cover concepts, tools, and issues pertaining to specification, modeling, analysis, simulation, testing and synthesis of digital systems, including PLD, FPGA, and ASIC devices.

Prerequisites: Knowledge about Digital Logic, Microprocessors, Computer Architecture, and Object Oriented Programming,.

Course Text: C. Roth, *Digital Systems Design Using VHDL (2nd Edition),* CL-Engineering Publisher, March 2007 (ISBN-10: 0534384625, ISBN-13: 978-0534384623).

Contents: The topics will include, but not be limited to:

1. Concepts of Digital Logic and Principles of Digital Circuits Design
2. Advanced Minimization Techniques
3. Programmable Logic Devices (PLDs, CPLDs, FPGAs) Fundamentals
4. Introduction to ASICs and ASIC Design Methodology
5. Analysis, Modeling and Partitioning for Logic Synthesis and VHDL Coding
6. Constraining Designs, Synthesizing, Simulation and Optimization
7. Design for Testability, Built-In Self-Test, and Fault Tolerance
8. Digital System Reliability
9. Noise and Transmission Line Effects

Evaluation:

Mini-Labs (3):	6 %
Design project:	29 %
Problem set (4):	0 %
Midterm:	20 %
Final exam:	45 %

Important Dates:

Problem Sets:	Jan 25, Feb. 8, Mar. 15, Mar. 31.
Project Proposal:	Jan 28, 2011
Mid-Term:	Mar. 1, 2011(Tentative)
Project Meeting:	Week of Mar. 14-18, 2011 (TBA.)
Project Presentation:	Week of Mar. 21-25, 2011 (TBA.)
Project Demo:	Week of Mar. 28-Apr.1, 2011 (TBA.)
Project Report:	Week of Apr. 8, 2011

Teaching Assistants:

Yi Zhang Office: EN-4031 E-mail: yz7384@mun.ca

Computer-Aided Design Tools:

Synopsys and Cadence CAD Tools for Digital System VLSI Design

Suggested Design Project Directions (not limited to):

1. General purpose and application specific processors, e.g., DLX, MIPS, DSP, and Grid Computing Processor.
2. Digital Filters.
3. Algorithms Implementations, e.g., BIST, Sorting, Routing, and Buffer Control.
4. Reconfigurable Architectures.
5. Parallel Processing

Other Notes:

1. Best Project Awards:

   The best 1-2 projects (in terms of novelty, achievements, presentation, and report) will be awarded 2 bonus marks for each individual. I will sponsor selected projects for possible NECEC'11 publication from my grant.

2. Academic Dishonesty:

   Academic dishonesty will not be tolerated. Reference to other people's work must be clearly specified and cited. The work in question will receive a grade of zero, and a formal process might be started. Be very careful of falling prey to plagiarism or any form of academic dishonesty.

References:

1. J. R. Armstrong, *VHDL Design Representation and Synthesis (Second Edition)*, Prentice Hall, 2000
2. M. D. Ciletti, *Advanced Digital Design with the Verilog HDL*, Prentice Hall, 2002
3. Z. Navabi, *VHDL: Analysis and Modeling of Digital Systems*, McGraw Hill (Second Edition), 1998
4. Z. Navabi, *Verilog Digital System Design*, McGraw Hill, 1999
5. S. Palnitkar, *VHDL Design Representation and Synthesis (Second Edition),* Prentice Hall, 2000
6. P. J. Ashenden, *The Designer's Guide to VHDL*, Morgan Kaufmann Publisher, Inc, 1996
7. C. Roth, *Digital System Design Using VHDL*, PWS Publishing Co., 1998
8. S. Brown and Z. Vranesic, *Fundamentals of Digital Logic with VHDL Design*, McGraw Hill, 2000
9. J. Wakerly, *Digital Design: Principles and Practices (Six Edition)*, Prentice Hall, 2000
10. Yalamanchili, *VHDL Starter's Guide: From Simulation to Synthesis*, Prentice Hall, 1999
11. Neil H.E. Weste, Kamran Eshraghian, *Principles of CMOS VLSI Design,* Addison Wesley; 2nd edition; Oct 1994, ISBN: 0201533766
12. Michael J. S. Smith, *Application-Specific Integrated Circuits,* Addison-Wesley; June 1997
13. J. Bhasker, *VHDL Primer (Third Edition),* Prentice Hall, 1999